# Sensitivity analysis of climate change risk assessment

## Study of parameters variation in hazard indicators

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Midterm discussion, 4 July 2024

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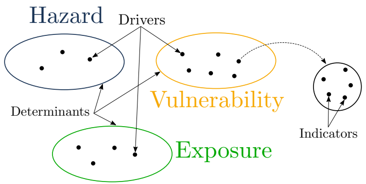




Introduction
- Risk: potential for adverse consequences for human or ecological systems [...]
- Climate Change Risk Assessment (CCRA)

1. Few definitions to have a common starting point, all from IPCC AR6.
2. Estimation of risk related to climate change, i.e. determined by potential impacts of climate change and human responses to climate change.
3. Some additional definitions are needed, e.g. determinants of risk, risk drivers.
4. If quantitative, CCRA conveys numerical values combining the chosen indicators.

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## Case study

- Torino Airport



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Case study
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- Hazard drivers: heat wave, heavy precipitation

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2. Hazard drivers are from the European Taxonomy of climate hazards.

# Climate datasets

- Climatological baseline: ERA5
- Climate projections: NEX-GDDP-CMIP6



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# ERA5

- Organisation: European Centre for Medium-Range Weather Forecasts
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# NEX-GDDP-CMIP6

- Organisation: NASA Earth Exchange
- Data type: statistically downscaled bias-corrected climate projections
- Spatial resolution: 0.25° x 0.25°
- Time frequency: day
- Historical period 1950-2014, projection period 2015-2100
- Model: EC-Earth3
- Scenario: SSP1-2.6, SSP2-4.5, SSP5-8.5



1. Only model EC-Earth3 is considered for the midterm discussion.

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# Spatial domain

- Box of 3 x 3 grid points centred at the coordinates of the airport



Spatial domain
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- Baseline period: 1994-2023
- Time horizons: 2021-2040, 2051-2070, 2081-2100



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1. The $n$ is one of the parameters of the indicator. Select intervals of variation of parameters and evaluate indicators for each combination of them.
2. A value for each determinant is evaluated, which is the aggregation of the respective indicators. The aggregation include also a normalisation step, hence the final value is in the interval $[0, 1]$ and values from different determinants can be compared to each other. Risk is the weighted mean of those values and in this project the weights are set to 1 because exposure and vulnerability are constant, hence the relation between risk and hazard is linear and no interesting information is added by considering different weigths. Finally the risk values are classified in a rank of 5 classes, by splitting the interval $[0, 1]$ in 5 equally sized subintervals.

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1. Regrid ERA5

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└─Preprocessing

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4. Training period 1950-1999, test period 2000-2014. Quantile Delta Mapping for both temperature and precipitation, show p-p plot for qualitative assessment of the adjustment.

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3. Temporal aggregation
4. Risk evaluation

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2. Sample average, check standard deviation.
3. Sample average, check standard deviation.
4. Given exposure and vulnerability, evaluate the final risk.

# Next steps

- Uncertainty evaluation
- Evaluate risk with non-linear relations among hazard indicators and among determinants
- Extend analysis to Bologna's and Ciampino's airports

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